



RESEARCH ARTICLE

**BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SENSITIVITY PATTERN OF BLOOD ISOLATES FROM NEONATAL ICU OF A TERTIARY CARE HOSPITAL IN NORTH INDIA**

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ABSTRACT

**Introduction:** Neonatal sepsis is a common but dreadful problem faced by neonatologists and is responsible for approximately 25% of all neonatal deaths in the world. Neonates are at increased risk of contracting infections due to immature immune system. It is difficult to clinically diagnose sepsis in these babies because the clinical features of sepsis are subtle in these neonates. Culture and sensitivity remains the gold standard test to diagnose and treat neonates in this situation. Moreover knowledge of prevalent bacterial flora and its susceptibility patterns in a particular neonatal intensive care unit is essential for empirical antibiotic therapy because the treatment of sepsis needs to be immediately started and any delay in starting appropriate antibiotic therapy can prove fatal. For this reason it is important to determine bacteriological profile and antibiotic susceptibility patterns of blood isolates from every neonatal intensive care unit. We conducted this cross sectional study to determine bacteriological profile and antibiotic susceptibility pattern from blood cultures collected from neonatal intensive care units of our institute.

**Aims and Objective:** To determine bacteriological profile and antibiotic susceptibility pattern of blood isolates from neonatal intensive care unit.

**Materials and Methods:** This was a cross sectional study carried out in microbiology department. The blood samples were processed by conventional blood culture and identification of the organism was done by standard bacteriological techniques. Antibiotic sensitivity was performed by Kirby Bauer disc-diffusion method in accordance to Clinical Laboratory Standards Institute (CLSI) 2016 guidelines.

**Results:** A total of 1521 blood samples were received from NICU. Of these, bacteraemia could be confirmed by culture in 12.3% (187/1521) cases. In the present study, Gram-negative organisms predominated being responsible for 76% (142/187) of cases of septicaemia followed by the gram positive organisms in 24% (45/187) cases.

**Conclusion:** Establishing bacteriological profile and susceptibility patterns of isolates from a particular neonatal intensive care unit is a critical step in managing neonatal sepsis. Such knowledge is critical in deciding empirical antibiotic therapy by treating neonatologist. Our study identified the prevalent organisms and provided with sensitivity patterns of the organisms prevalent in neonatal intensive care unit.

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INTRODUCTION

Sepsis is a commonly encountered and potentially life-threatening problem in neonatal intensive care units (NICU). It is defined as a deleterious host response to infection documented by a positive blood culture in the first 4 weeks of life eventually leading to septic shock and multi organ failure (Gheorghita *et al.*, 2015; Chen *et al.*, 2014; Singh *et al.*, 1991). Sepsis is the commonest cause of mortality in neonates which is responsible for about 30-50% of neonatal mortality in the

developing countries (Bang *et al.*, 1999; Stoll, 1997; Sharma *et al.*, 2013). The mortality from septicaemia prior to the antibiotic era was 90%, but it declined with the use of antibiotics to 24- 58% (Kaushik *et al.*, 1998). Neonatal infections can be acquired in utero through ruptured membranes or transplacentally, intrapartum in the birth canal during delivery and postpartum from external sources after birth leading to sepsis in the newborn. Most commonly it occurs through an infected birth canal. Sometimes ascending infection can also occur if delivery is delayed after rupture of membranes. Sepsis related neonatal mortality is largely preventable with prevention of sepsis, its timely recognition, rational antimicrobial therapy and aggressive supportive care.

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Blood culture is the gold standard for diagnosis of septicemia and should be performed in all cases of suspected sepsis prior to starting antibiotics (Ng *et al.*, 2010). The emergence of multi-drug resistant strains has however limited the choice of available antibiotics. Thus, understanding the antibiotic resistance pattern of common neonatal pathogens is critical for both effective therapy and infection control. The present study was undertaken to determine the bacteriological profile and antimicrobial susceptibility pattern of prevalent pathogens isolated from the blood of septicemic neonates from Neonatal Intensive Care Unit (NICU) of GMCH, Chandigarh.

## MATERIAL AND METHODS

We conducted a review of hospital records to examine the bacterial organisms and their drug-sensitivity in blood cultures collected from neonates admitted in NICU of our tertiary-care hospital in Chandigarh between July 2016 and June 2017. Blood samples of these neonates were collected with strict aseptic precautions. The blood samples were processed by conventional blood culture and identification of the organism was done by standard bacteriological techniques including Gram staining, colony characteristics, and biochemical properties (Collee *et al.*, 1996). Antibiotic sensitivity was performed by Kirby Bauer disc-diffusion method in accordance to Clinical Laboratory Standards Institute (CLSI) 2016 guidelines (Wayne, 2016).

## RESULTS

A total of 1521 blood samples were received from NICU. Of these, bacteraemia could be confirmed by culture in 12.3% (187/1521) cases. In the present study, Gram-negative organisms predominated being responsible for 76% (142/187) of cases of septicemia followed by the gram positive organisms in 24% (45/187) cases. Amongst the Gram negative organisms, *Klebsiella pneumoniae* was most frequently isolated in 31% (58/187) followed by *Escherichia coli* 19.7% (37/187), *Acinetobacter baumannii* complex 15.5% (29/187) and *Citrobacter* spp. 9.62% (18/187). ESBL positivity was seen in 63.15% (60/95) strains out of total 95 *E.coli* and *Klebsiella pneumoniae* strains. Carbapenamase resistance in *Klebsiellapneumoniae* accounted for 10% (6/58) and in *E.coli* it was found to be 8% (3/37). Carbapenamase resistant *Acinetobacter baumannii* complex accounts for about 38% (11/29). Amongst the Gram positive organisms *Staphylococcus aureus* was the most common [17.1% (32/187)] with 6.3% being MRSA. The other gram positive organisms obtained were *Enterococcus faecalis* 3.74% (7/187) and Coagulase Negative *Staphylococcus* (CONS) [3.20% (6/187)]. All *Enterococci* were sensitive to vancomycin. The most effective drugs in Gram negative organisms were imipenem and piperacillin-tazobactam while in Gram positive organism's vancomycin and gentamicin were found to be the most effective antimicrobials.

## DISCUSSION

In the absence of prescription auditing people go for over the counter drugs and ultimately leading to misuse of antimicrobials which has contributed to a rise in antimicrobial resistance. The measures for improving the prescription

practices of the doctors and documenting trends of resistance over the years would guide us in reducing the burden of antimicrobial resistance and determining future usage of antibiotics. In our study, *Klebsiella pneumoniae* continues to be the major pathogen along with *E.coli* and *Staphylococcus aureus* similar to findings by Kumhar *et al.* 2002 and Anwer *et al.* 2000. An alarming finding in our study was the emerging carbapenem resistance which could be due to the widespread use of carbapenems in ICU and this problem of resistance could be tackled by stringent infection-control practices, regular antibiotic susceptibility surveillance and by the use of a rational antibiotic policy. Carbapenem sparing drug for NICU can be piperacillin-tazobactam. There cannot be a single recommendation for the antibiotic regimen of neonatal sepsis for all settings. The choice of antibiotics depends on the antimicrobial sensitivity of the isolated bacterial pathogens.

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